

An experimental investigation on the effect of surface roughness on the performance of magnus wind turbine

ABSTRACT

Wind turbine that used airfoil-shaped blades cannot harvest wind energy at low speed wind condition efficiently. A wind turbine that used Magnus effect is proposed to overcome the wind speed problem. Magnus wind turbine (MWT) performance can be further enhanced by using sanded surface on the rotating cylinder blades but the surface roughness effect on MWT are not yet fully explored. Experimental approach by wind tunnel is conducted in order to understand the effect of surface roughness. Blades rotation speed and wind speed are the controlled variables. Meanwhile, torque, torque coefficient and tip speed ratio are the measured variables. The experiment shows that sanded surface roughness can significantly increase the MWT performance up to four times based on torque production in comparison with the smooth surface. In conclusion, the results proved that surface roughness can be used to improve MWT.

Keyword: Magnus wind turbine; Roughness; Tip speed ratio; Torque coefficient; Velocity ratio